Known Biologically Important Areas for Cetaceans Hawaii

The information compiled here represents work done by Robin Baird of Cascadia Research Collective, with review and revisions contributed by the Cetacean Mapping Working Group members. Information presented was compiled from peer reviewed literature, National Marine Fisheries Service (NMFS) Stock Assessment Reports, and expert knowledge.

Disclaimer

This information pertains to known areas of feeding, calves, migratory corridors, resident populations or small populations of cetaceans in U.S. EEZ waters, based on data collected from visual surveys, passive acoustic recordings, genetics and satellite tags. Humpback whales listed here can be found outside the U.S. EEZ. Lack of inclusion here should not be interpreted as lack of occurrence, or lack of important areas, outside of U.S. EEZ.

Table of Contents

Feresa attenuata (Pygmy Killer Whale) 2
Globicephala macrorhynchus (Short-Finned Pilot Whale) 6
Kogia sima (Dwarf Sperm Whale) 11
Megaptera novaeangliae (Humpback Whale) 14
Mesoplodon densirostris (Blainville's Beaked Whale) 15
Peponocephala electra (Melon-Headed Whale) 20
Pseudorca crassidens (False Killer Whale) 25
Stenella attenuata (Pantropical Spotted Dolphin) 29
Stenella longirostris (Spinner Dolphin) 33
Steno bredanensis (Rough-Toothed Dolphin) 37
Tursiops truncatus (Common Bottlenose Dolphin) 40
Ziphius cavirostris (Cuvier's Beaked Whale) 44

List of Figures

Figure 1: Pygmy killer whale small resident population 2
Figure 2: Short finned pilot whale small resident population 7
Figure 3: Dwarf sperm whale small resident population 12
Figure 4: Blainville's beaked whale small resident population 16
Figure 5: Melon-headed whale small resident population 21
Figure 6: False killer whale small resident population 25
Figure 7: Pantropical spotted dolphins small resident populations 29
Figure 8: Spinner dolphin small resident populations 33
Figure 9: Rough-toothed dolphin small resident population 38
Figure 10: Tursiops truncatus small resident population 41
Figure 11: Cuvier's beaked whale small resident population 45

Feresa attenuata (Pygmy Killer Whale)

Important Area(s) identified: small resident population

Small Resident Population

High re-sighting rates of photo-identified pygmy killer whales suggest a small population size and a high degree of site fidelity to the island of Hawai‘i (McSweeney et al. 2009). Individuals have been documented over spans of up to 24 years off the island (McSweeney et al. 2009; CRC unpublished), suggesting they are long-term residents. Two individuals that were satellite tagged (in two different years, Figure 1) remained strongly associated with the island slope during the periods of tag attachment (10 and 22 days; Baird et al. 2011). Only one individual documented off the island of Hawai‘i has also been documented off another island (O‘ahu) and that individual had only been seen on a single occasion off the island of Hawai‘i. The known range of the resident population includes the west side of the island of Hawai‘i, from northwest of Kawaihae south to the south point of the island, and along the southeast coast of the island, as determined by locations from two satellite tagged individuals (Baird et al. 2011). Given the small sample size this range is likely to increase if additional satellite tag data become available. Assessment of potential genetic differentiation of pygmy killer whales off the island of Hawai‘i from other areas has not been undertaken due to insufficient genetic sample sizes.

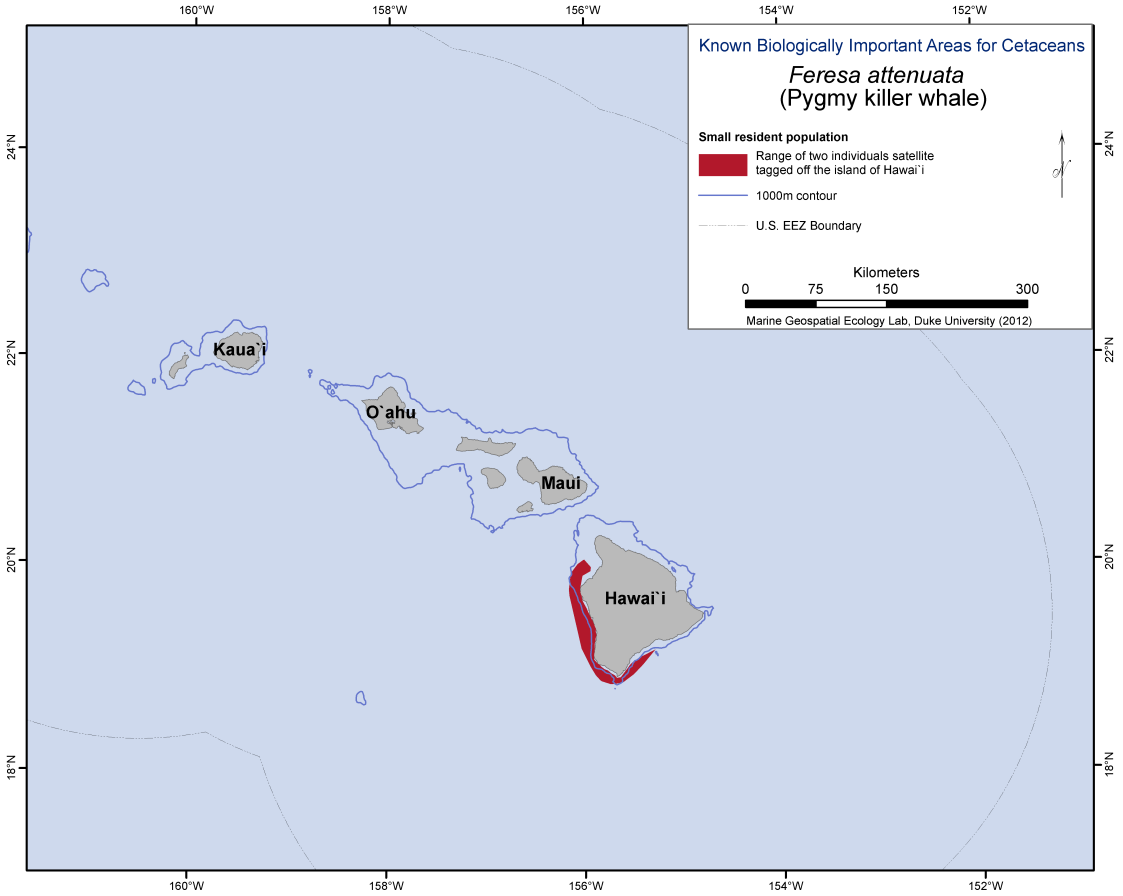

Figure 1: Pygmy killer whale small resident population

References

Baird, R.W., G.S. Schorr, D.L. Webster, D.J. McSweeney, M.B. Hanson and R.D. Andrews. 2011. Movements of two satellite-tagged pygmy killer whales (*Feresa attenuata*) off the isalnd of Hawai'i. Marine Mammal Science 27:E332-E337. Available at http://www.cascadiaresearch.org/hawaii/Bairdetal_MMS2011.pdf

McSweeney, D.J., R.W. Baird, S.D. Mahaffy, D.L. Webster and G.S. Schorr. 2009. Site fidelity and association patterns of a rare species: pygmy killer whales (*Feresa attenuata*) in the main Hawaiian Islands. Marine Mammal Science 25:557-572. Available at http://www.cascadiaresearch.org/robin/McSweeney%20et%20al%20Feresa.pdf

Metadata

Area Name or ID Number		Hawaii Island
Area Type (see choices below)		Small Resident Population
Migration Direction (if applicable)		NA
Months of year designation is applicable		All year
Satellite Tagging data supporting designation (y/n)		Y
	# of tags	4 (2 individuals in 2 different years)
	# years in which supporting tagging data collected	2 years
	Nature of supporting information (see description below)	Individuals remained strongly associated with the island slope during the periods of tag attachment (10 and 22 days).
Visual Observations/Records supporting designation (y/n)		
	# observations/records	
	# years in which supporting visual data collected	
	Nature of supporting information	
Acoustic Detections/Records supporting designation (y/n)		
	# detections/records	
	# years in which supporting acoustic data collected	
	Nature of supporting information	
Photo-ID evidence supporting designation (y/n)		Y
	# individuals photographed	
	# of years of photo records to compare	24 (April 1985 - December 2007)
	maximum # years same individual photo'd in area	24
	Nature of supporting information	
Genetic Analyses conducted supporting designation (y/n)		N
	weak/moderate/strong support for genetic differentiation	
	Nature of supporting information	
What factors justify the boundary selection?	The known range of the resident population includes the west side of the island of Hawai'i, from northwest of Kawaihae south to the south point of the island, and along the southeast coast of the island, as determined by locations from two satellite tagged individuals (likely to increase with additional tag data).	
Dataset Sources		
Approximate % of population that uses this area for the designated purpose (if known)		

Approximate # of areas known specifically for this behavior (if feeding/cow-calf/mating/migratory) for this population		

Globicephala macrorhynchus (Short-Finned Pilot Whale)

Important Area(s) identified: small resident population

Small Resident Population

Evidence from analyses of sighting and effort data, long-term photo-identification data, and satellite tag deployments all indicate the existence of a resident population of short-finned pilot whales off the island of Hawai'i (Baird et al. 2011a; Mahaffy 2012). Analyses of 10 years of survey effort show this species is primarily associated with slope habitats off the island, with highest sighting density between 1000 and 2500 m in depth, with density dropping off substantially after 2500 m in depth (Baird et al. 2011a). Long-term re-sightings of individuals indicate high site fidelity and suggest that at least some proportion of the population is resident to the island (Mahaffy 2012). Satellite tags were deployed on 44 occasions on 41 different individual short-finned pilot whales off Hawai'i Island in six different years for periods ranging from 3 to 110 days (median = 31 days), with individuals remaining strongly associated with the island slope in all but one case. A contiguous high-use area has been identified through the analysis of tag data from 35 tag deployments (through 2010), with the highest density of satellite tag locations along the west side of the island of Hawai'i, extending somewhat off the north tip of the island and along the southeast slope of the island (Figure 2). This high-use area was defined following the methods of Baird et al. (2011b), with the study area broken into 5 km x 5 km grid cells and the total time of satellite tracks within each cell allocated to the cell. Cells with total time greater than 1 standard deviation above the mean were classified for this analysis as high-use areas, and the largest contiguous block of high use cells is identified. Assessment of potential genetic differentiation of short-finned pilot whales off the island of Hawai'i from other areas has not yet been undertaken, however a preliminary genetic analysis using mitochondrial DNA showed that short-finned pilot whales around the main Hawaiian Islands were differentiated from those elsewhere in the Pacific (Chivers et al. 2003).

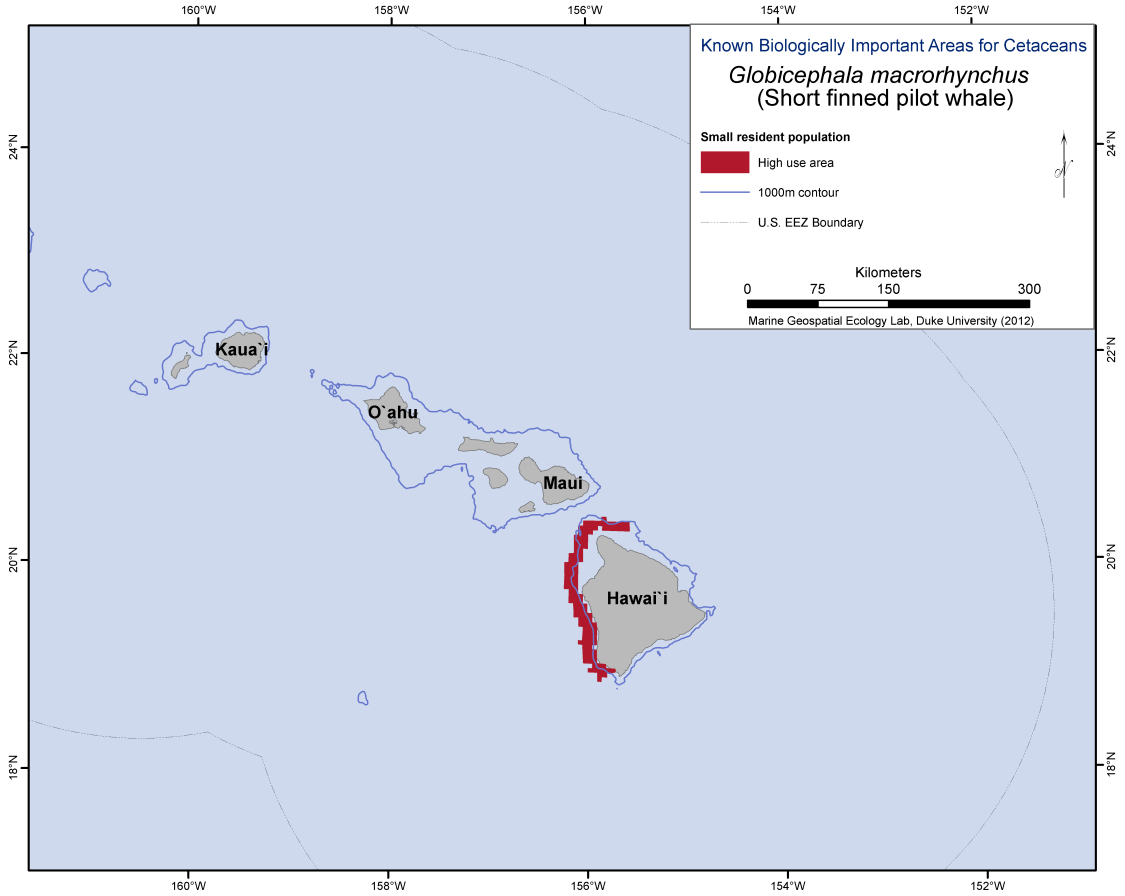

Figure 2: Short finned pilot whale small resident population

References

Baird RW, Schorr GS, Webster DL, McSweeney DJ, Mahaffy SD, Hanson MB, Andrews RD. 2011a. Movements of satellite-tagged short-finned pilot whales in the Hawaiian Islands: evidence for multiple populations within the Hawaiian archipelago. Talk at the Workshop on Science and Conservation of Hawaiian Odontocetes, Tampa, Florida, November 26, 2011.

Baird, R.W., M.B. Hanson, G.S. Schorr, D.L. Webster, D.J. McSweeney, A.M. Gorgone, S.D. Mahaffy, D. Holzer, E.M. Oleson, and R.D. Andrews. 2011b. Assessment of range and primary habitats of Hawaiian insular false killer whales: a scientific basis for determination of "critical habitat". Document PSRG-2011-17 submitted to the Pacific Scientific Review Group, October 2011. Available at http://www.cascadiaresearch.org/hawaii/PSRG-2011-17_Bairdetal.pdf

Chivers, S.J., R.G. LeDuc and R.W. Baird. 2003. Hawaiian island populations of false killer whales and short-finned pilot whales revealed by genetic analyses. In Abstracts of the 15th Biennial Conference on the Biology of Marine Mammals, Greensboro, NC, December 2003. Available at http://www.cascadiaresearch.org/robin/Chiversetalabstract.pdf

Mahaffy, S.D. 2012. Site fidelity, associations and long-term bonds of short-finned pilot whales off the island of Hawai'i**.** M.Sc. Thesis, Portland State University. 151 pp. Available at http://www.cascadiaresearch.org/hawaii/Mahaffy_MScThesis_2012.pdf

Metadata

Area Name or ID Number		Hawaii Island
Area Type (see choices below)		Small Resident Population
Migration Direction (if applicable)		NA
Months of year designation is applicable		All year
Satellite Tagging data supporting designation (y/n)		Y
	# of tags	44 (44 tags, 41 animals)
	# years in which supporting tagging data collected	6 years
	Nature of supporting information (see description below)	A contiguous high-use area has been identified through the analysis of tag data from 35 tag deployments (through 2010), with the highest density of satellite tag locations along the west side of the island of Hawai'i, extending somewhat off the north tip of the island and along the southeast slope of the island
Visual Observations/Records supporting designation (y/n)		Y
	# observations/records	
	# years in which supporting visual data collected	10 years
	Nature of supporting information	This species is primarily associated with slope habitats off the island, with highest sighting density between 1000 and 2500 m in depth, with density dropping off substantially after 2500 m in depth
Acoustic Detections/Records supporting designation (y/n)		
	# detections/records	
	# years in which supporting acoustic data collected	
	Nature of supporting information	
Photo-ID evidence supporting designation (y/n)		Y
	# individuals photographed	448 (156 core residents, 150 residents, 142 visitors)
	# of years of photo records to compare	5 years (2003 - 2007)
	maximum # years same individual photo'd in area	5 years
	Nature of supporting information	
Genetic Analyses conducted supporting designation (y/n)		Y
	weak/moderate/strong support for genetic differentiation	Preliminary
	Nature of supporting information	A preliminary genetic analysis using mitochrondrial DNA showed that short-finned pilot whales around the main Hawaiian Islands were differentiated from those elsewhere in the Pacific

What factors justify the boundary selection?	This high-use area was defined following the methods of Baird et al. (2011b), with the study area broken into 5 km x 5 km grid cells and the total time of satellite tracks within each cell allocated to the cell. Cells with total time greater than 1 standard deviation above the mean were classified for this analysis as high-use areas, and the largest contiguous block of high use cells is identified.	
Dataset Sources		
Approximate % of population that uses this area for the designated purpose (if known)		
Approximate # of areas known specifically for this behavior (if feeding/cow-calf/mating/migratory) for this population		

Kogia sima (Dwarf Sperm Whale)

Important Area(s) identified: small resident population

Small Resident Population

Results from analyses of depths at sightings in relation to effort and photo-identification data both suggest there is a small resident population of dwarf sperm whales off the island of Hawai'i (Mahaffy et al. 2009; CRC unpublished). Analyses of sighting rates by depth, corrected for effort, indicate the highest sighting rates of dwarf sperm whales off the island of Hawai'i are between 500 and 1,000 m in depth. Sighting rates drop by more than two-thirds in waters >1,000 m, suggesting dwarf sperm whales are strongly island-associated and use relatively near-shore slope habitats. Despite the infrequent encounter rates with this species (Baird 2005), a number of individuals documented off the island of Hawai'i have been seen in more than one year, with one individual documented in five different years over a seven-year span (CRC unpublished). Neonates and small calves are regularly documented, suggesting it is an area used for calving as well as feeding. No individuals of this species have been satellite tagged so knowledge of the range of the population is limited to sighting locations from boat-based visual surveys off the island of Hawai'i. The area identified as the range (Figure 3) is a minimum convex polygon around 55 sightings of dwarf sperm whales from small-boat surveys (CRC unpublished data). Assessment of potential genetic differentiation of dwarf sperm whales off the island of Hawai'i from other areas has not been undertaken due to insufficient genetic sample sizes.

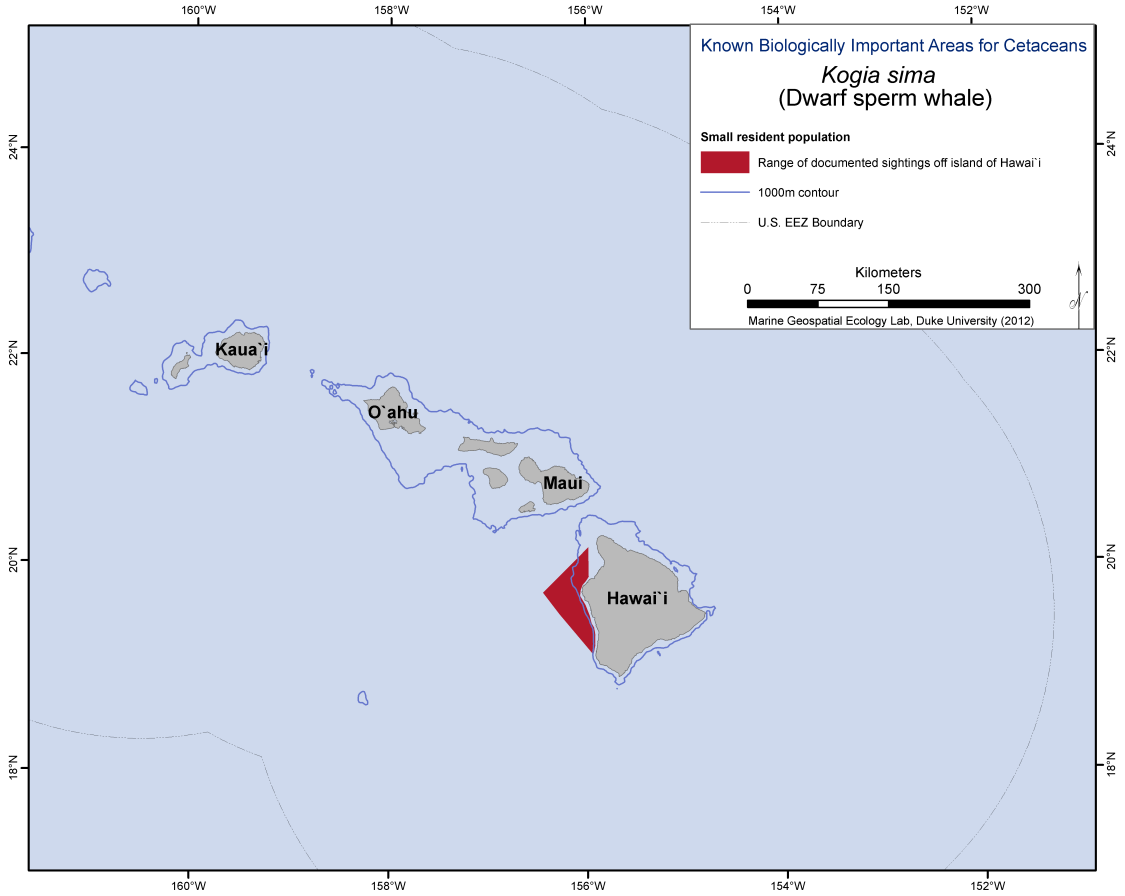

Figure 3: Dwarf sperm whale small resident population

References

Baird, R.W. 2005. Sightings of dwarf (*Kogia sima*) and pygmy (*K. breviceps*) sperm whales from the main Hawaiian Islands. Pacific Science 59:461-466. www.cascadiaresearch.org/robin/Baird%20Hawaii%20Kogia.pdf

Mahaffy, S.D., R.W. Baird, D.J. McSweeney, D.L. Webster, and G.S. Schorr. 2009. Individual photo-identification of dwarf sperm whales off the island of Hawai'i; evidence of site fidelity and a small population size. Poster presented at the 18th Biennial Conference on the Biology of Marine Mammals, Quebec, Oct. 2009. www.cascadiaresearch.org/hawaii/Mahaffyetal2009posterhandout.pdf

Metadata

Area Name or ID Number		Hawaii Island
Area Type (see choices below)		Small Resident Population
Migration Direction (if applicable)		NA
Months of year designation is applicable		All year
Satellite Tagging data supporting designation (y/n)		N
	# of tags	
	# years in which supporting tagging data collected	
	Nature of supporting information (see description below)	
Visual Observations/Records supporting designation (y/n)		Y
	# observations/records	
	# years in which supporting visual data collected	
	Nature of supporting information	The highest sighting rates of dwarf sperm whales off the island of Hawai‘i are between 500 and 1,000 m in depth.
Acoustic Detections/Records supporting designation (y/n)		
	# detections/records	
	# years in which supporting acoustic data collected	
	Nature of supporting information	
Photo-ID evidence supporting designation (y/n)		Y
	# individuals photographed	21
	# of years of photo records to compare	7 years (2003 - 2009)
	maximum # years same individual photo'd in area	4.5 years
	Nature of supporting information	
Genetic Analyses conducted supporting designation (y/n)		N
	weak/moderate/strong support for genetic differentiation	
	Nature of supporting information	
What factors justify the boundary selection?		Minimum convex polygon around 55 sightings of dwarf sperm whales from small-boat surveys.
Dataset Sources		CRC unpublished
Approximate % of population that uses this area for the designated purpose (if known)		
Approximate # of areas known specifically for this behavior (if feeding/cow-calf/mating/migratory) for this population		

Megaptera novaeangliae (Humpback Whale)

Important Areas delineated: cow-calf

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Mesoplodon densirostris (Blainville's Beaked Whale)

Important Area(s) identified: small resident population

Small Resident Population

Off the island of Hawai'i a small resident population of Blainville's beaked whales has been identified. Analyses of sightings in relation to effort by depth show highest density of groups in water between 500 and 1500 m in depth, with density decreasing further offshore (Cascadia Research Collective, unpublished data). Long-term photo-identification has indicated high site-fidelity, with individuals using the area over periods of at least 15 years, although there is evidence that adult females may exhibit a greater degree of site fidelity than adult males (McSweeney et al. 2007). Mark-recapture analyses of photo-identification data suggest the population is relatively small (Baird et al. 2009). Baird et al. (2009) estimated 125 individual Blainville's beaked whales (CV = 0.30) used the area off the west side of the island of Hawai'i from 2003-2006, although this estimate included individuals from both the resident population and from an offshore population (Baird et al. 2011), suggesting the resident population is smaller. Ten individuals from this population (including four adult males) have been satellite tagged in four different years, with over 1,800 satellite-derived locations available to assess range and habitat use. Location information from satellite tags was available for periods of from 15 to 71 days (median = 44 days, n = 10). All 10 individuals remained associated with the island of Hawai'i for the duration of tag attachments, with tag data generally restricted to the west side of the island (Schorr et al. 2009). The delineation of the known range of the population (Figure 4) is based on a minimum convex polygon (with smoothed edges and excluding land) around 1,809 locations from 10 satellite tagged individuals (Schorr et al. 2009; Baird et al. 2010; Cascadia Research Collective unpublished data). Assessment of potential genetic differentiation of Blainville's beaked whales off the island of Hawai'i from other areas has not been undertaken due to insufficient genetic sample sizes.

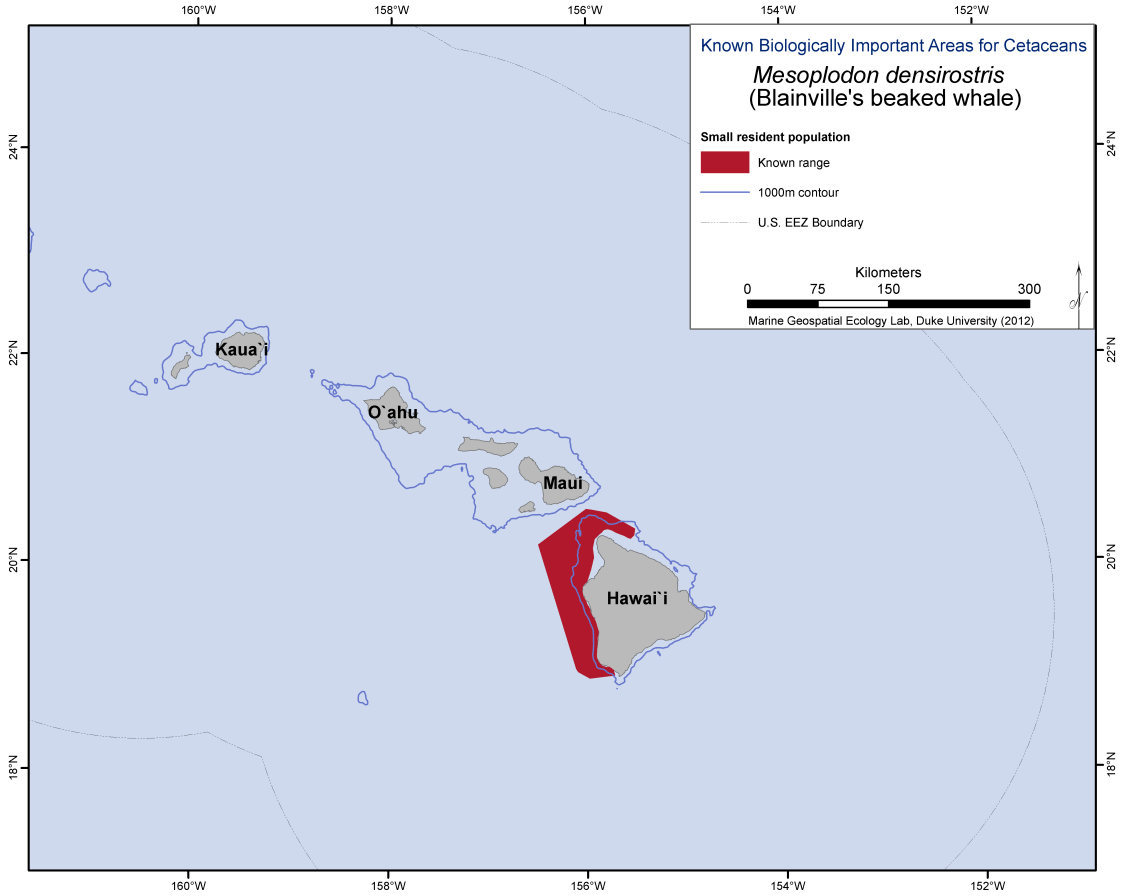

Figure 4: Blainville's beaked whale small resident population

References

Baird, R.W., G.S. Schorr, D.L. Webster, S.D. Mahaffy, D.J. McSweeney, M.B. Hanson, and R.D. Andrews. 2011. Open-ocean movements of a satellite-tagged Blainville's beaked whale (*Mesoplodon densirostris*): evidence for an offshore population in Hawai'i? Aquatic Mammals 37:506-511. Available at http://www.cascadiaresearch.org/hawaii/Baird_et_al_Mesoplodon_Aquatic_Mammals_2011.pdf

Baird, R.W., G.S. Schorr, D.L. Webster, D.J. McSweeney, M.B. Hanson and R.D. Andrews. 2010. Movements and habitat use of Cuvier's and Blainville's beaked whales in Hawai'i: results from satellite tagging in 2009/2010. Report prepared under Order No. AB133F09SE4843 from the Southwest Fisheries Science Center, La Jolla, CA. Available at http://www.cascadiaresearch.org/hawaii/CRCHawaiibeakedwhalemovements2010.pdf

Baird, R.W., D.J. McSweeney, G.S. Schorr, S.D. Mahaffy, D.L. Webster, J. Barlow, M.B. Hanson, J.P. Turner and R.D. Andrews. 2009. Studies of beaked whales in Hawai'i: population size, movements, trophic ecology, social organization and behaviour. ECS Special Publication 51:23-25. Available at http://www.cascadiaresearch.org/robin/Baird%20et%20al%202009%20ECS%20proceedings.pdf

McSweeney, D.J., R.W. Baird and S.D. Mahaffy. 2007. Site fidelity, associations and movements of Cuvier's (*Ziphius cavirostris*) and Blainville's (*Mesoplodon densirostris*) beaked whales off the island of Hawai'i. Marine Mammal Science 23:666-687. Available at http://www.cascadiaresearch.org/robin/McSweeney%20et%20al%202007.pdf

Schorr, G.S., R.W. Baird, M.B. Hanson, D.L. Webster, D.J. McSweeney and R.D. Andrews. 2009. Movements of satellite-tagged Blainville's beaked whales off the island of Hawai'i. Endangered Species Research 10:203-213. Available at http://www.cascadiaresearch.org/hawaii/SchorretalESR2009.pdf

Metadata

Area Name or ID Number		Hawaii Island
Area Type (see choices below)		Small Resident Population
Migration Direction (if applicable)		NA
Months of year designation is applicable		All year
Satellite Tagging data supporting designation (y/n)		Y
	# of tags	10 individuals
	# years in which supporting tagging data collected	4
	Nature of supporting information (see description below)	Satellite tags data for periods of from 15 to 71 days. All 10 individuals remained associated with the island of Hawai'i for the duration of tag attachments, with tag data generally restricted to the west side of the island.
Visual Observations/Records supporting designation (y/n)		Y
	# observations/records	
	# years in which supporting visual data collected	10
	Nature of supporting information	Analysis of sighting and survey data show highest density of groups in water between 500 and 1500 m in depth, with density decreasing further offshore.
Acoustic Detections/Records supporting designation (y/n)		
	# detections/records	
	# years in which supporting acoustic data collected	
	Nature of supporting information	
Photo-ID evidence supporting designation (y/n)		Y
	# individuals photographed	>50
	# of years of photo records to compare	21 years between May 1986 - May 2012
	maximum # years same individual photo'd in area	15 years
	Nature of supporting information	Photo-id of distinctive individuals showing long-term site fidelity
Genetic Analyses conducted supporting designation (y/n)		N
	weak/moderate/strong support for genetic differentiation	
	Nature of supporting information	
What factors justify the boundary selection?	A minimum convex polygon (with smoothed edges and excluding land) around 1,809 locations from 10 satellite tagged individuals.	
Dataset Sources		

Approximate % of population that uses this area for the designated purpose (if known)		< 125 individuals likely
Approximate # of areas known specifically for this behavior (if feeding/cow-calf/mating/migratory) for this population		

Peponocephala electra (Melon-Headed Whale)

Important Area(s) identified: small resident population

Small Resident Population

Although melon-headed whales are broadly distributed within Hawaiian waters (Barlow 2006; Woodworth et al. 2011), off the island of Hawai‘i a resident population has been identified (Figure 5). Dispersal analyses based on photo-identification data (Aschettino et al. 2011a) and preliminary genetic analyses of biopsy samples (Aschettino et al. 2011b) both suggest this population is demographically isolated from a population of melon-headed whales that extends throughout the main Hawaiian Islands and into offshore waters (Aschettino et al. 2011b; Schorr et al. 2009; Woodworth et al. 2011). Abundance estimated for the Hawai‘i Island Resident Population using mark-recapture analyses of photo-identification data was 447 individuals (CV=0.12; Aschettino 2010). Based on photo-identification throughout the main Hawaiian Islands and satellite tagging of four individuals (tagged in three different years, with tag data available for periods of from 5 to 26 days, median = 10 days) the Hawai‘i Island Resident Population appears to have a range restricted to the northwest coast of the island of Hawai‘i (Aschettino et al. 2011a, 2011b; Cascadia Research Collective, unpublished data) in significantly shallower water than the main Hawaiian Islands population. The delineation of the range of this population is based on a minimum convex polygon (with smoothed edges and excluding land) around locations obtained from four satellite tagged individuals (n = 545 locations; Cascadia Research Collective unpublished data), which also encompasses the range based on sightings presented by Aschettino et al. (2011a).

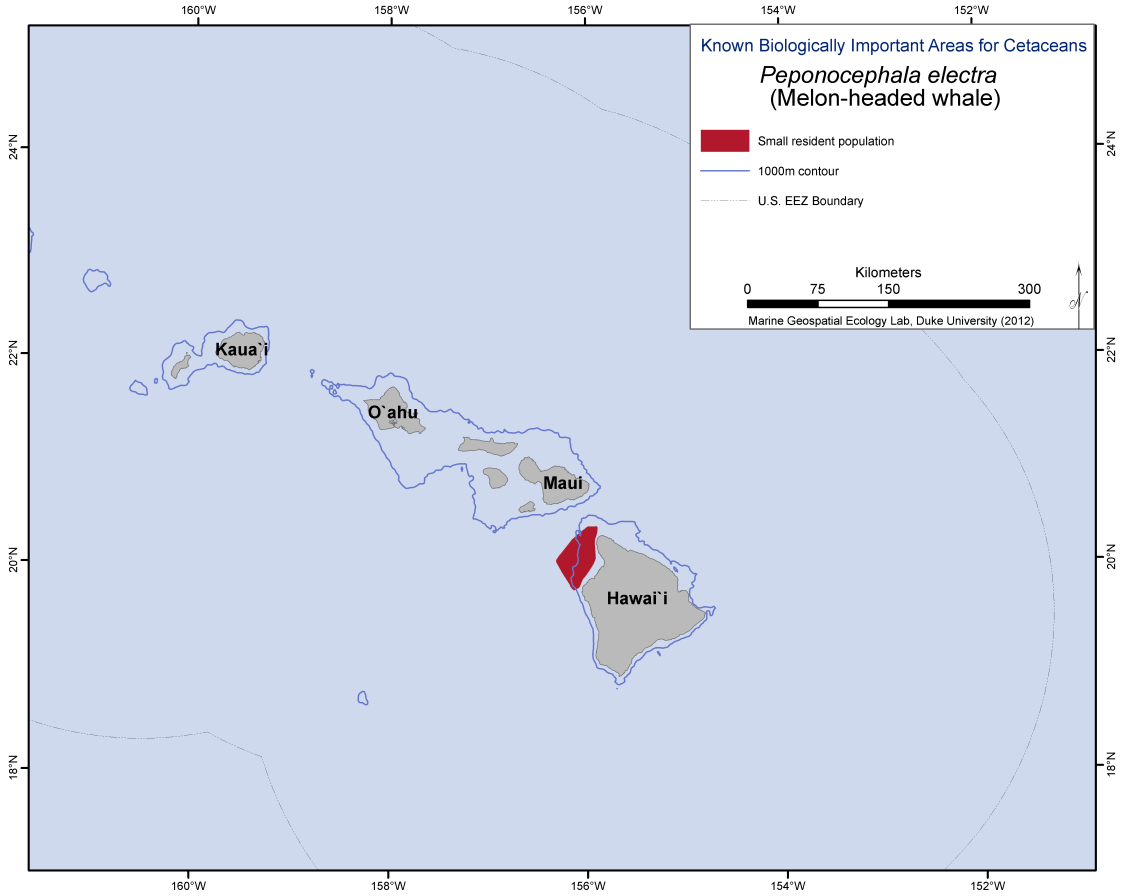

Figure 5: Melon-headed whale small resident population

References

Aschettino, J.M. 2010. Population size and structure of melon-headed whales (*Peponocephala electra*) around the main Hawaiian Islands: evidence of multiple populations based on photographic data. M.Sc. Thesis, Hawai‘i Pacific University. 117 pp. Available at http://www.cascadiaresearch.org/hawaii/AschettinoThesis.pdf

Aschettino, J.M., R.W. Baird, D.J. McSweeney, D.L. Webster, G.S. Schorr, J.L. Huggins, K.K. Martien, S.D. Mahaffy, and K.L. West. 2011a. Population structure of melon-headed whales (*Peponocephala electra*) in the Hawaiian Archipelago: evidence of multiple populations based on photo-identification. Marine Mammal Science doi: 10.1111/j.1748-7692.2011.00517.x Available at http://www.cascadiaresearch.org/hawaii/Aschettino_et_al_2011.pdf

Aschettino, J.M., R.W. Baird, G.S. Schorr, K.K. Martien, D.J. McSweeney, D.L. Webster, J.L. Huggins, S.D. Mahaffy, and K.L. West. 2011b. Photo-identification, genetic, and telemetry data show evidence of two populations of melon-headed whales (*Peponocephala electra*) in Hawai‘i. Talk presented at the Workshop on Science and Conservation of Hawaiian Odontocetes, Tampa, FL, November 26, 2011. Also in Abstracts of the 19th Biennial Conference on the Biology of Marine Mammals, Tampa,FL.

Baird, R.W., J.M. Aschettino, D.J. McSweeney, D.L. Webster, G.S. Schorr, S. Baumann-Pickering and S.D. Mahaffy. 2010. Melon-headed whales in the Hawaiian archipelago: an assessment of population structure and long-term site fidelity based on photo-identification. Report prepared under Order No. JG133F09SE4440 to Cascadia Research Collective from the Southwest Fisheries Science Center, National Marine Fisheries Service, La Jolla, CA. Available at http://www.cascadiaresearch.org/hawaii/Bairdetalmelonheadedwhales2010.pdf

Schorr, G.S., R.W. Baird, D.L. Webster, D.J. McSweeney, M.B. Hanson, J. Polovina, and R.D. Andrews. 2009. Satellite tagging of melon-headed whales in Hawai‘i reveals widely dispersed movement patterns. Talk presented at the 18th Biennial Conference on the Biology of Marine Mammals, Quebec, October 2009.

Woodworth, P.A., G.S. Schorr, R.W. Baird, D.L. Webster, D.J. McSweeney, M.B. Hanson, R.D. Andrews and J.J. Polovina. 2011. Eddies as offshore foraging grounds for melon-headed whales (*Peponocephala electra*). Marine Mammal Science doi: 10.1111/j.1748-7692.2011.00509.x Available at http://www.cascadiaresearch.org/hawaii/Woodworthetal2011.pdf

Metadata

Area Name or ID Number		Hawaii Island
Area Type (see choices below)		Small Resident Population
Migration Direction (if applicable)		NA
Months of year designation is applicable		All year
Satellite Tagging data supporting designation (y/n)		Y
	# of tags	12 (4 individuals tagged in 3 years)
	# years in which supporting tagging data collected	3
	Nature of supporting information (see description below)	Tag data for periods of from 5 to 26 days indicate a range restricted to the northwest coast of the island of Hawai'i in significantly shallower water than the main Hawaiian Islands population.
Visual Observations/Records supporting designation (y/n)		
	# observations/records	
	# years in which supporting visual data collected	
	Nature of supporting information	
Acoustic Detections/Records supporting designation (y/n)		
	# detections/records	
	# years in which supporting acoustic data collected	
	Nature of supporting information	
Photo-ID evidence supporting designation (y/n)		Y
	# individuals photographed	1,433 (1,046 distinctive)
	# of years of photo records to compare	10 years (2000 - 2009)
	maximum # years same individual photo'd in area	22 years
	Nature of supporting information	
Genetic Analyses conducted supporting designation (y/n)		Y
	weak/moderate/strong support for genetic differentiation	Preliminary
	Nature of supporting information	
What factors justify the boundary selection?	A minimum convex polygon (with smoothed edges and excluding land) around locations obtained from four satellite tagged individuals (n = 545 locations), which also encompasses the range based on sightings presented by Aschettino et al. (2011a).	
Dataset Sources		

Approximate % of population that uses this area for the designated purpose (if known)		~447 individuals
Approximate # of areas known specifically for this behavior (if feeding/cow-calf/mating/migratory) for this population		

Pseudorca crassidens (False Killer Whale)

Important Area(s) identified: small resident population

Small Resident Population

The most recent estimate of abundance for the Hawaiian Insular Stock of false killer whales is 151 individuals (CV = 0.20; model average of four mark-recapture models from 2006-2009; Oleson et al. 2010), and this population is currently being considered for listing as Endangered under the U.S. Endangered Species Act. The known range of this population based on satellite tagging data extends from west of Ni'ihau to east of Hawai'i with the furthest extent offshore of 122 km (Baird et al. 2012). Within this range it is possible to delineate high use areas based on density of location data obtained from satellite tags (see Baird et al. 2011 for details). To aid in identifying "critical habitat" for this population Baird et al. (2012) identified several high use areas (Figure 6) based on grid cells that were greater than 2 standard deviations above the mean for density of locations. Baird et al. (2012) note a variety of limitations of their sample, including a seasonal bias in tag data, and having telemetry data from only two of the three large social groupings within the population, when spatial use is known to vary between social groups. For this assessment grid cells with density of locations greater than 1 standard deviation above the mean are considered high use areas and mapped accordingly.

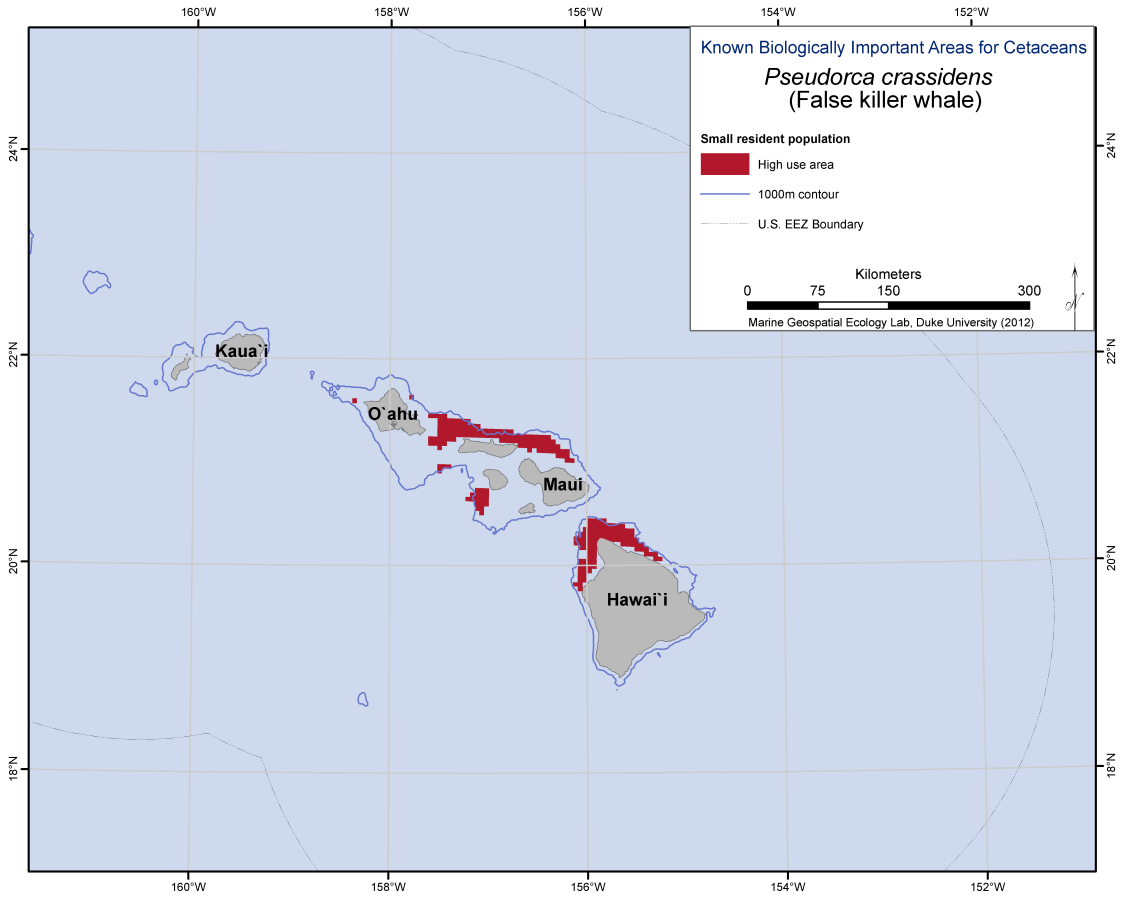

Figure 6: False killer whale small resident population

References

Baird, R.W. 2009. Preliminary revised mark-recapture population estimates for insular stock false killer whales. Presentation to the Pacific Scientific Review Group, November 2009.

Baird, R.W., M.B. Hanson, G.S. Schorr, D.L. Webster, D.J. McSweeney, A.M. Gorgone, S.D. Mahaffy, D. Holzer, E.M. Oleson, and R.D. Andrews. 2012. Range and primary habitats of Hawaiian insular false killer whales: an assessment to inform determination of "critical habitat". Endangered Species Research, accepted for publication.

Oleson, E. M., C. H. Boggs, K. A. Forney, M. B. Hanson, D. R. Kobayashi, B. L. Taylor, P. R. Wade, and G. M. Ylitalo. 2010. Status review of Hawaiian insular false killer whales (Pseudorca crassidens) under the Endangered Species Act. U.S. Dep. Commer., NOAA Tech. Memo., NOAA-TM-NMFS-PIFSC-22, 140 p. + Appendices.

Metadata

Area Name or ID Number		Hawaiian Insular Stock
Area Type (see choices below)		Small Resident Population
Migration Direction (if applicable)		NA
Months of year designation is applicable		All year
Satellite Tagging data supporting designation (y/n)		Y
	# of tags	27
	# years in which supporting tagging data collected	2007 -2010
	Nature of supporting information (see description below)	The known range of this population based on satellite tagging data extends from west of Niʻihau to east of Hawaiʻi with the furthest extent offshore of 122 km.
Visual Observations/Records supporting designation (y/n)		
	# observations/records	
	# years in which supporting visual data collected	
	Nature of supporting information	
Acoustic Detections/Records supporting designation (y/n)		
	# detections/records	
	# years in which supporting acoustic data collected	
	Nature of supporting information	
Photo-ID evidence supporting designation (y/n)		Y
	# individuals photographed	
	# of years of photo records to compare	at least 4 years
	maximum # years same individual photo'd in area	
	Nature of supporting information	
Genetic Analyses conducted supporting designation (y/n)		
	weak/moderate/strong support for genetic differentiation	
	Nature of supporting information	
What factors justify the boundary selection?		Grid cells with density of locations greater than 1 standard deviation above the mean are considered high use areas (based on tag data).
Citations		Baird 2009; Baird et al. 2012
Dataset Sources		
Shapefile?		Y
Approximate % of population that uses this area for the designated purpose (if known)		~146 individuals

Approximate # of areas known specifically for this behavior (if feeding/cow-calf/mating/migratory) for this population		

Stenella attenuata (Pantropical Spotted Dolphin)

Important Area(s) identified: small resident population

Small Resident Populations

Genetic evidence suggests that there are three demographically-isolated populations of pantropical spotted dolphins around the main Hawaiian Islands (Figure 7), with significant genetic differentiation between populations off O'ahu, in the "4-island area" (Moloka'i, Lana'i, Maui, Kaho'olawe) and off Hawai'i Island (Courbis 2011). The levels of genetic differentiation are similar to those found among recognized stocks of spinner dolphins and common bottlenose dolphins within the Hawaiian archipelago (Carretta et al. 2011). The boundaries of these populations are not known, due to biased survey effort off the leeward sides of the islands. The known ranges of pantropical spotted dolphins off each island can be assessed using sighting data from small-boat surveys (see map), although small-boat survey effort is restricted to the leeward (west) shores of the islands so is known to be biased.

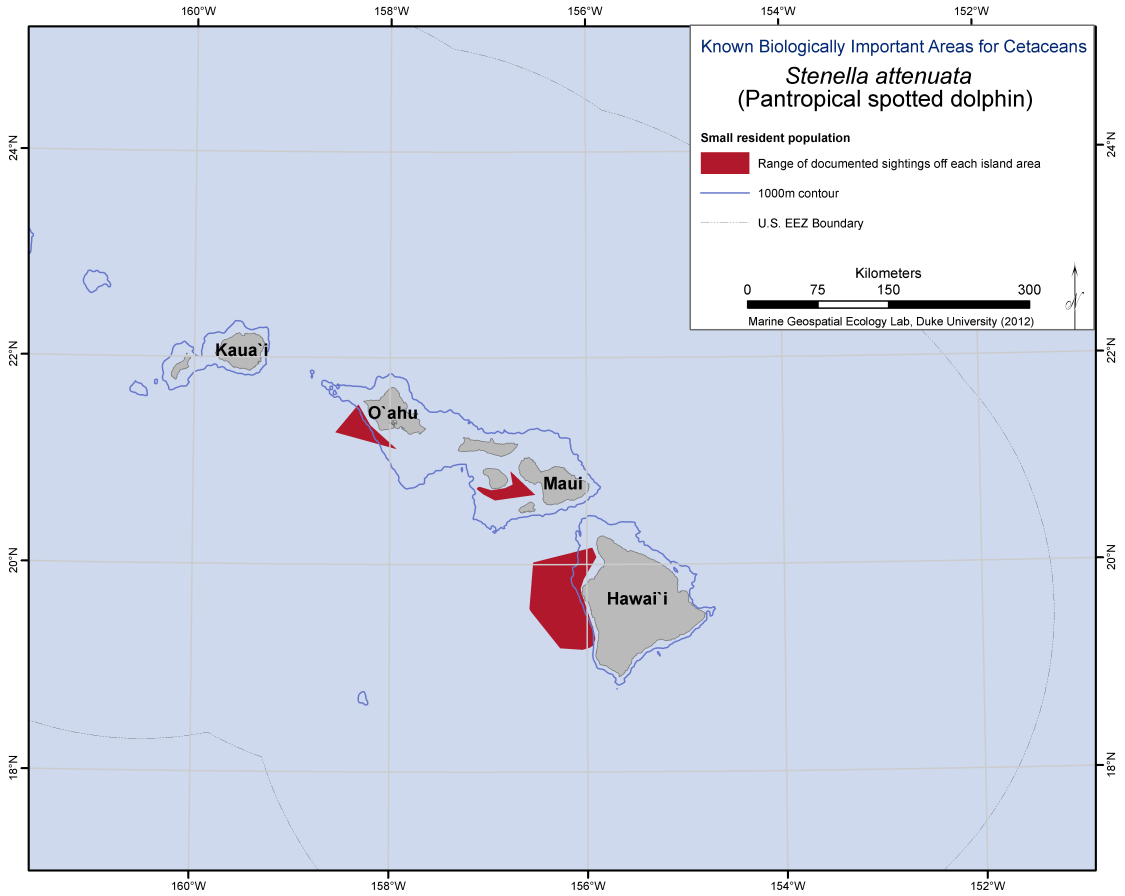

Figure 7: Pantropical spotted dolphins small resident populations

References

Carretta, J. V., Forney, K. A., Oleson, E., Martien, K., Muto, M. M., Lowry, M.S., Barlow, J., Baker, J., Hanson, B., Lynch, D., Carswell, L., Brownell, R. L., Jr., Robbins, J., Mattila, D.K., Ralls, K., & Hill, M. C. (2011). U.S. Pacific marine mammal stock assessments: 2010. NOAA-TM-NMFS-SWFSC-476. Available at http://www.nmfs.noaa.gov/pr/pdfs/sars/po2010.pdf

Courbis, S.S. 2011. Population structure of island-associated pantropical spotted dolphins (*Stenella attenuata*) in Hawaiian waters. Ph.D. Dissertation, Portland State University. 173 pp. Available from http://www.cascadiaresearch.org/hawaii/courbis_dissertation_2011.pdf

Metadata

Area Name or ID Number		Main Hawaiian Islands
Area Type (see choices below)		Small Resident Populations
Migration Direction (if applicable)		NA
Months of year designation is applicable		All year
Satellite Tagging data supporting designation (y/n)		
	# of tags	
	# years in which supporting tagging data collected	
	Nature of supporting information (see description below)	
Visual Observations/Records supporting designation (y/n)		Y
	# observations/records	
	# years in which supporting visual data collected	
	Nature of supporting information	
Acoustic Detections/Records supporting designation (y/n)		
	# detections/records	
	# years in which supporting acoustic data collected	
	Nature of supporting information	
Photo-ID evidence supporting designation (y/n)		
	# individuals photographed	
	# of years of photo records to compare	
	maximum # years same individual photo'd in area	
	Nature of supporting information	
Genetic Analyses conducted supporting designation (y/n)		Y
	weak/moderate/strong support for genetic differentiation	Strong
	Nature of supporting information	Genetic evidence suggests that there are three demographically-isolated populations of pantropical spotted dolphins around the main Hawaiian Islands, with significant genetic differentiation between populations off Oʻahu, in the "4-island area" (Molokaʻi, Lanaʻi, Maui, Kahoʻolawe) and off Hawaiʻi Island (Courbis 2011)
What factors justify the boundary selection?	The known ranges of pantropical spotted dolphins off each island can be assessed using sighting data from small-boat surveys (see map), although small-boat survey effort is restricted to the leeward (west) shores of the islands so is known to be biased.	
Dataset Sources		
Approximate % of population that uses this area for the designated purpose (if known)		

Approximate # of areas known specifically for this behavior (if feeding/cow-calf/mating/migratory) for this population		

Stenella longirostris (Spinner Dolphin)

Important Area(s) identified: small resident population

Small Resident Populations

Genetic evidence suggests that there are five demographically-isolated populations of spinner dolphins throughout the Hawaiian archipelago (Figure 8) (Andrews et al. 2010). These five populations have recently been recognized as distinct stocks by the National Marine Fisheries Service (Carretta et al. 2011). The boundaries of these stocks as currently recognized by NMFS are from shore out to 10 nmi from shore around Kure and Midway Atolls, Pearl & Hermes Reef, Kaua'i and Ni'ihau, O'ahu and the 4-island area (Moloka'i, Lana'i, Maui, Kaho'olawe), and Hawai'i Island (Carretta et al. 2011).

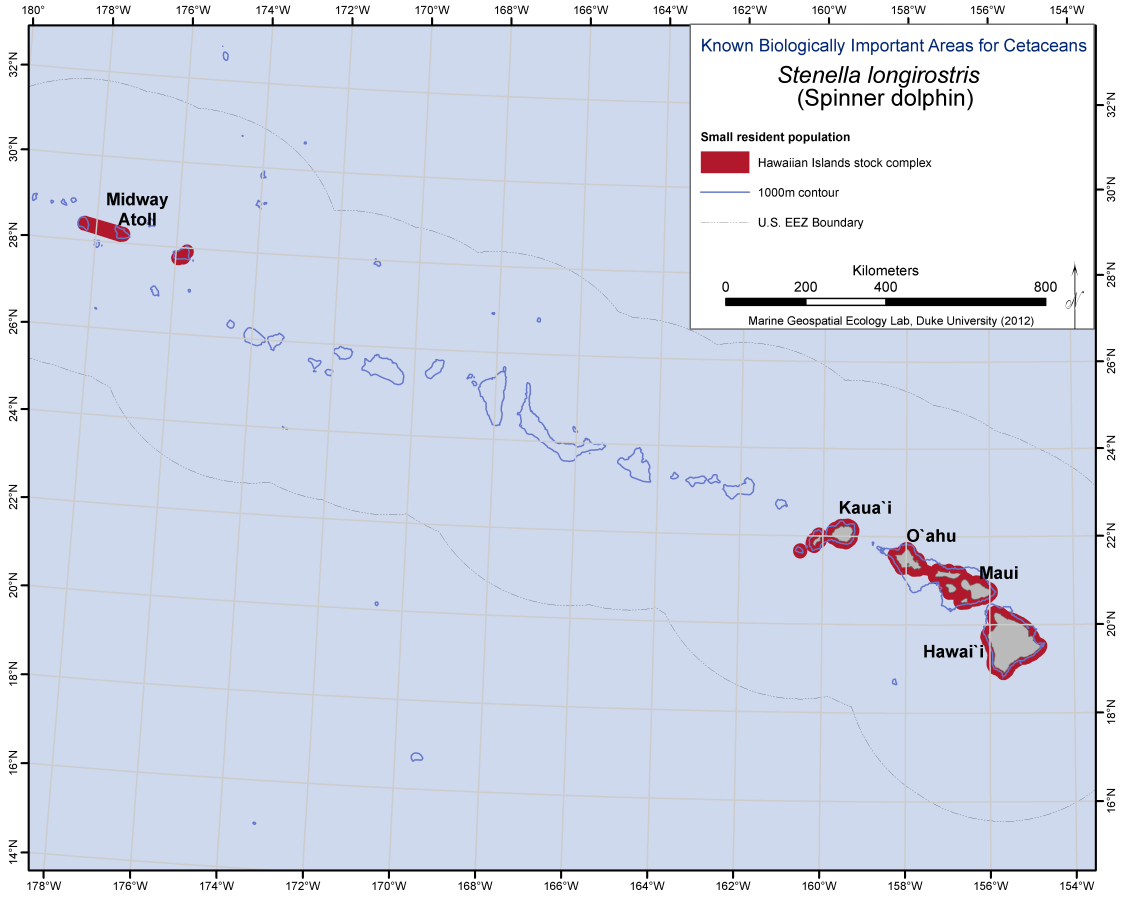

Figure 8: Spinner dolphin small resident populations

References

Andrews, K.R., L. Karczmarski, W.W.L. Au, S.H. Rickards, C.A. Vanderlip, B.W. Bowen, E.G. Grau, and R.J. Toonen. 2010. Rolling stones and stable homes: social structure, habitat diversity and population genetics of the Hawaiian spinner dolphin (*Stenella longirostris*). Molecular Ecology 19:732-748.

Carretta, J. V., Forney, K. A., Oleson, E., Martien, K., Muto, M. M., Lowry, M.S., Barlow, J., Baker, J., Hanson, B., Lynch, D., Carswell, L., Brownell, R. L., Jr., Robbins, J., Mattila, D.K., Ralls, K., & Hill, M. C. (2011). U.S. Pacific marine mammal stock assessments: 2010. NOAA-TM-NMFS-SWFSC-476. Available at http://www.nmfs.noaa.gov/pr/pdfs/sars/po2010.pdf

Metadata

Area Name or ID Number		Main Hawaiian Islands
Area Type (see choices below)		Small Resident Population
Migration Direction (if applicable)		NA
Months of year designation is applicable		All year
Satellite Tagging data supporting designation (y/n)		
	# of tags	
	# years in which supporting tagging data collected	
	Nature of supporting information (see description below)	
Visual Observations/Records supporting designation (y/n)		
	# observations/records	
	# years in which supporting visual data collected	
	Nature of supporting information	
Acoustic Detections/Records supporting designation (y/n)		
	# detections/records	
	# years in which supporting acoustic data collected	
	Nature of supporting information	
Photo-ID evidence supporting designation (y/n)		
	# individuals photographed	
	# of years of photo records to compare	
	maximum # years same individual photo'd in area	
	Nature of supporting information	
Genetic Analyses conducted supporting designation (y/n)		Y
	weak/moderate/strong support for genetic differentiation	
	Nature of supporting information	Genetic evidence suggests that there are five demographically-isolated populations of spinner dolphins throughout the Hawaiian archipelago. These five populations have recently been recognized as distinct stocks by the National Marine Fisheries Service.
What factors justify the boundary selection?		The boundaries of these stocks as currently recognized by NMFS are from shore out to 10 nmi from shore around Kure and Midway Atolls, Pearl & Hermes Reef, Kauaʻi and Niʻihau, Oʻahu and the 4-island area (Molokaʻi, Lanaʻi, Maui, Kahoʻolawe), and Hawaiʻi Island.
Dataset Sources		

Approximate % of population that uses this area for the designated purpose (if known)		
Approximate # of areas known specifically for this behavior (if feeding/cow-calf/mating/migratory) for this population		

Steno bredanensis (Rough-Toothed Dolphin)

Important Area(s) identified: small resident population

Small Resident Population

Off the island of Hawai‘i a small demographically-isolated resident population of rough-toothed dolphins has been identified (Baird et al. 2008; Albertson et al. 2011). A mark-recapture estimate of distinctive photo-identified individuals from 2003-2006 off the island of Hawai‘i was 198 individuals (CV = 0.12; Baird et al. 2008). Two individuals were documented moving from Kaua‘i to Hawai‘i, but were not seen with any of the dolphins known to be part of the resident social network off Hawai‘i, and thus were not known to have dispersed between the populations (Baird et al. 2008). An analysis of dispersal rates between these populations indicated that observed movements were consistent with, at most, a 2%/year dispersal rate between the two areas (Baird et al. 2008). Preliminary genetic analyses of samples collected from Kaua‘i and Hawai‘i indicated strong genetic differentiation between the two areas (Albertson et al. 2011; F_{ST} = 0.265; $p<0.001$), further supporting that the Hawai‘i Island resident population is demographically isolated. Additional photo-identification efforts since the Baird et al. (2008) analysis have shown that the two individuals documented moving from Kaua‘i to Hawai‘i have returned back to the island of Kaua‘i, and no other known movements between the areas have been documented to date (Cascadia Research Collective unpublished data). No individuals off the island of Hawai‘i have been satellite tagged, so information on the range is restricted to sighting locations from long-term small-boat survey effort, restricted to the west side of the island (Cascadia Research Collective unpublished). The map (Figure 9) shows a minimum convex polygon around all sighting locations of this species off the island of Hawai‘i.

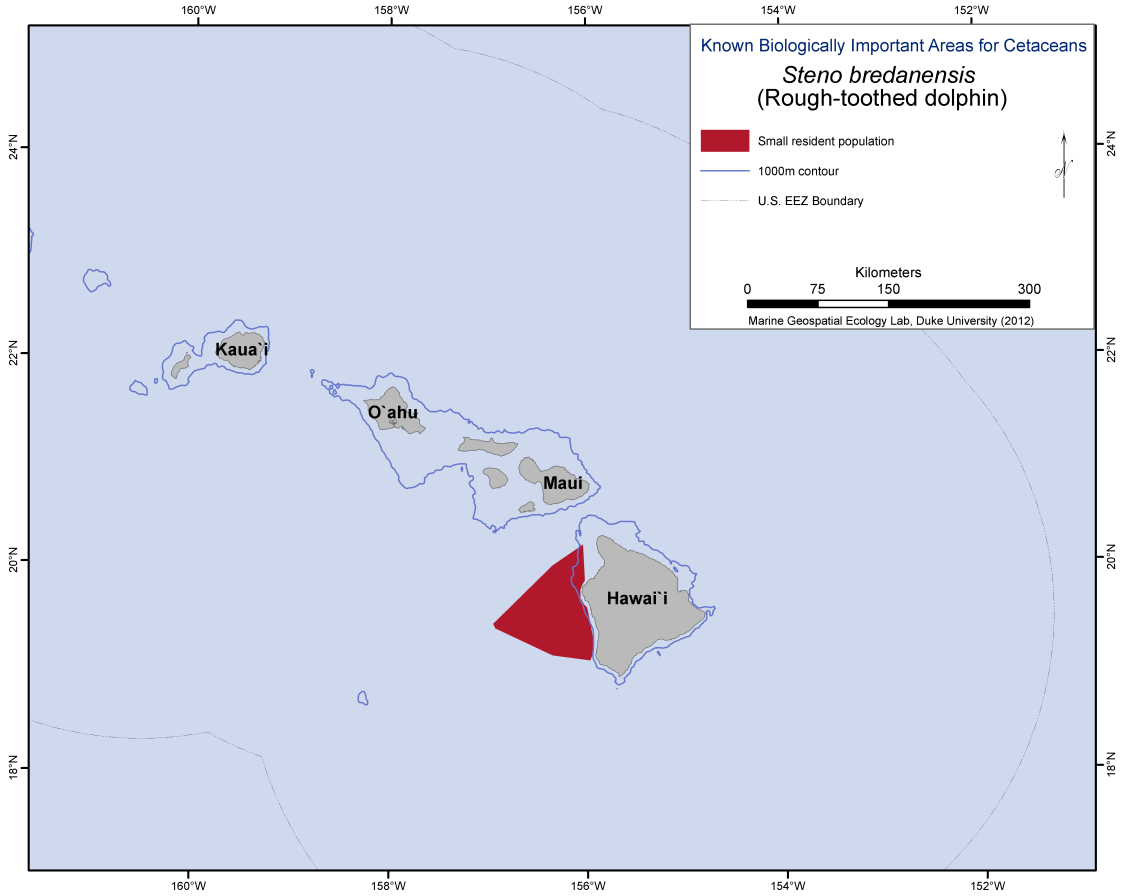

Figure 9: Rough-toothed dolphin small resident population

References

Albertson, G.R., M. Oremus, R.W. Baird, K.K. Martien, M.M. Poole, R.L. Brownell Jr., F. Cipriano and C.S. Baker. 2011. Staying close to home: genetic analyses reveal insular population structure for the pelagic dolphin *Steno bredanensis*. Pages 9-10 in Abstracts of the 19th Biennial Conference on the Biology of Marine Mammals, Tampa, Florida, November-December 2011. Available from www.cascadiaresearch.org/hawaii/Albertson_et_al_2011_abstract.pdf

Baird, R.W., D.L. Webster, S.D. Mahaffy, D.J. McSweeney, G.S. Schorr and A.D. Ligon. 2008. Site fidelity and association patterns in a deep-water dolphin: rough-toothed dolphins (*Steno bredanensis*) in the Hawaiian Archipelago. Marine Mammal Science 24:535-553. Available from www.cascadiaresearch.org/robin/Baird%20et%20al%20Hawaii%20Steno.pdf

Metadata

Area Name or ID Number		Hawaii Island
Area Type (see choices below)		Small Resident Population
Migration Direction (if applicable)		NA
Months of year designation is applicable		All year
Satellite Tagging data supporting designation (y/n)		N
	# of tags	
	# years in which supporting tagging data collected	
	Nature of supporting information (see description below)	
Visual Observations/Records supporting designation (y/n)		
	# observations/records	
	# years in which supporting visual data collected	
	Nature of supporting information	
Acoustic Detections/Records supporting designation (y/n)		
	# detections/records	
	# years in which supporting acoustic data collected	
	Nature of supporting information	
Photo-ID evidence supporting designation (y/n)		Y
	# individuals photographed	124
	# of years of photo records to compare	4 (2003 - 2006)
	maximum # years same individual photo'd in area	2.8 years
	Nature of supporting information	
Genetic Analyses conducted supporting designation (y/n)		Y
	weak/moderate/strong support for genetic differentiation	Strong
	Nature of supporting information	
What factors justify the boundary selection?		The map shows a minimum convex polygon around all sighting locations of this species off the island of Hawai‘i.
Dataset Sources		
Approximate % of population that uses this area for the designated purpose (if known)		~198 individuals
Approximate # of areas known specifically for this behavior (if feeding/cow-calf/mating/migratory) for this population		

Tursiops truncatus (Common Bottlenose Dolphin)

Important Area(s) identified: small resident population

Small Resident Population

Three lines of evidence suggest that there are four demographically-isolated island-associated populations of common bottlenose dolphins (hereafter bottlenose dolphins) around the main Hawaiian Islands (Baird et al. 2009; Martien et al. 2011). Around the main Hawaiian Islands sighting rates of this species are substantially higher in shallow near-shore areas (e.g., <1,000 m) than in deeper water, suggesting island-associated populations (Baird et al. 2009). There are high within- and between-year re-sighting rates of bottlenose dolphins off Kauaʻi/Niʻihau, in the 4-islands, and off Hawaiʻi Island, suggesting resident populations. No movements among these island areas have been identified, and the lack of documented movements is consistent with annual dispersal rates among island of less than 2% (Baird et al. 2009). Significant genetic differentiation has been found between populations off Kauaʻi/Niʻihau, Oʻahu, in the "4-island area" (Molokaʻi, Lanaʻi, Maui, Kahoʻolawe) and off Hawaiʻi Island (Martien et al. 2011), and these four have been recognized as distinct stocks (Carretta et al. 2011), with the 1,000 m isobath considered the outer stock boundaries (Figure 10). The boundary between the Oʻahu stock and the 4-island region stock was set as a line dividing the two areas approximately equidistant between Oʻahu and Molokaʻi with Penguin Bank included with the 4-island stock (Carretta et al. 2011). Estimates of the abundance of the marked individuals for each island area are available from mark-recapture analysis of photo-identification data, and indicate that populations off Hawaiʻi Island, in the 4-island area, and off Kauaʻi and Niʻihau are all relatively small (e.g., likely <250 marked individuals in each; Baird et al. 2009).

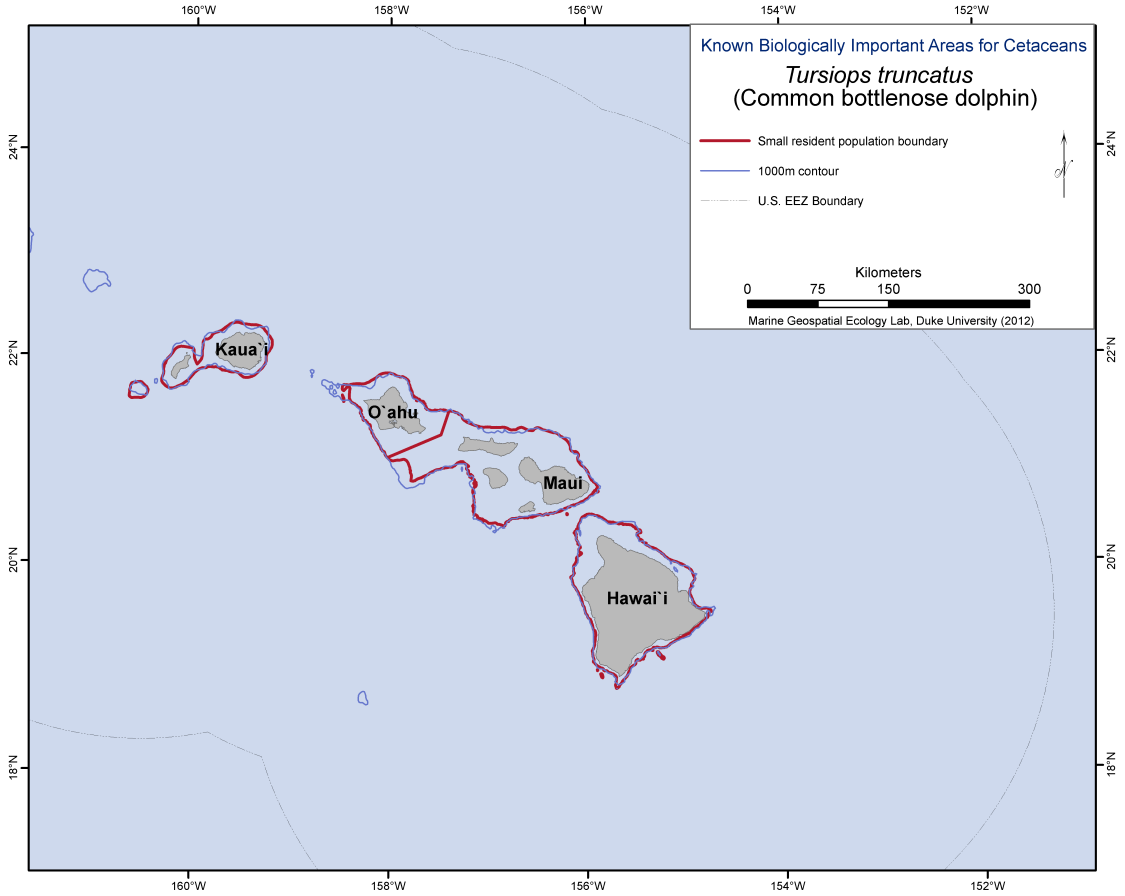

Figure 10: Tursiops truncatus small resident population

References

Baird, R.W., A.M. Gorgone, D.J. McSweeney, A.D. Ligon, M.H. Deakos, D.L. Webster, G.S. Schorr, K.K. Martien, D.R. Salden, and S.D. Mahaffy. 2009. Population structure of island-associated dolphins: evidence from photo-identification of common bottlenose dolphins (*Tursiops truncatus*) in the main Hawaiian Islands. Marine Mammal Science 25:251-274. Available at http://www.cascadiaresearch.org/robin/Bairdetal2009HawaiiTursiops.pdf

Carretta, J. V., Forney, K. A., Oleson, E., Martien, K., Muto, M. M., Lowry, M.S., Barlow, J., Baker, J., Hanson, B., Lynch, D., Carswell, L., Brownell, R. L., Jr., Robbins, J., Mattila, D.K., Ralls, K., & Hill, M. C. (2011). U.S. Pacific marine mammal stock assessments: 2010. NOAA-TM-NMFS-SWFSC-476. Available at http://www.nmfs.noaa.gov/pr/pdfs/sars/po2010.pdf

Martien, K.K., R.W. Baird, N.M. Hedrick, A.M. Gorgone, J.L. Thieleking, D.J. McSweeney, K.M. Robertson, and D.L. Webster. 2011. Population structure of island-associated dolphins: evidence from mitochondrial and microsatellite markers for common bottlenose dolphins (*Tursiops truncatus*) around the main Hawaiian Islands. Marine Mammal Science doi: 10.1111/j.1748-7692.2011.00506.x Available at http://www.cascadiaresearch.org/hawaii/Martien_et_al_2011.pdf

Metadata

Area Name or ID Number		Main Hawaiian Islands
Area Type (see choices below)		Small Resident Population
Migration Direction (if applicable)		NA
Months of year designation is applicable		All year
Satellite Tagging data supporting designation (y/n)		
	# of tags	
	# years in which supporting tagging data collected	
	Nature of supporting information (see description below)	
Visual Observations/Records supporting designation (y/n)		Y
	# observations/records	
	# years in which supporting visual data collected	
	Nature of supporting information	Sighting rates of this species are substantially higher in shallow near-shore areas (e.g., <1,000 m) than in deeper water, suggesting island-associated populations.
Acoustic Detections/Records supporting designation (y/n)		
	# detections/records	
	# years in which supporting acoustic data collected	
	Nature of supporting information	
Photo-ID evidence supporting designation (y/n)		Y
	# individuals photographed	
	# of years of photo records to compare	7
	maximum # years same individual photo'd in area	
	Nature of supporting information	Estimates of the abundance of the marked individuals for each island area are available from mark-recapture analysis of photo-identification data, and indicate that populations off Hawai‘i Island, in the 4-island area, and off Kaua‘i and Ni‘ihau are all relatively small (e.g., likely <250 marked individuals in each), with no movements among islands
Genetic Analyses conducted supporting designation (y/n)		Y
	weak/moderate/strong support for genetic differentiation	Strong
	Nature of supporting information	Significant genetic differentiation has been found between populations off Kaua‘i/Ni‘ihau, O‘ahu, in the “4-island area” (Moloka‘i, Lana‘i, Maui, Kaho‘olawe) and off Hawai‘i Island, and these four have been recognized as distinct stocks, with the 1,000 m isobath considered the outer stock boundaries.

What factors justify the boundary selection?	There are high within- and between-year re-sighting rates of bottlenose dolphins off Kauaʻi/Niʻihau, in the 4-islands, and off Hawaiʻi Island, suggesting resident populations. No movements among these island areas have been identified, and the lack of documented movements is consistent with annual dispersal rates among island of less than 2%.	
Dataset Sources		
Approximate % of population that uses this area for the designated purpose (if known)		likely <250 marked individuals in each area
Approximate # of areas known specifically for this behavior (if feeding/cow-calf/mating/migratory) for this population		

Ziphius cavirostris (Cuvier's Beaked Whale)

Important Area(s) identified: small resident population

Small Resident Population

Off the island of Hawai'i a small resident population of Cuvier's beaked whales has been identified. Analyses of sightings in relation to effort by depth show highest density of groups in water between 1,500 and 3,500 m in depth along the slope of the island, with density decreasing further offshore (Cascadia Research Collective, unpublished data). Long-term photo-identification has indicated high site-fidelity, with individuals using the area over periods of at least 18 years, although there is evidence that adult females may exhibit a greater degree of site fidelity than adult males (McSweeney et al. 2007; Cascadia Research Collective, unpublished data). Mark-recapture analyses of photo-identification data suggest the population is relatively small; Baird et al. (2009) estimated 55 individual Cuvier's beaked whales (CV = 0.26) used the area off the west side of the island of Hawai'i from 2003-2006. Nine individuals from this population (including one adult male) have been satellite tagged in five different years, with movement data for periods of from 2 to 43 days (median = 22 days). Satellite tag data show the population is generally restricted to slope of the island of Hawai'i (Schorr et al. 2008; Baird et al. 2009b, 2010), with the majority of individuals spending most of their time off the west and southeast side of the island. The delineation of the known range of the population (Figure 11) is based on a minimum convex polygon (excluding land and locations in shallow water with steep bathymetry, thus likely due to Argos error) around 581 locations from nine satellite tagged individuals (Schorr et al. 2008; Baird et al. 2009b, 2010; Cascadia Research Collective unpublished data). Although the number of individuals tagged is relatively large, the shorter attachment durations yet greater range documented than Blainville's beaked whales suggest that the range of individuals from this population is likely to increase as additional satellite tag data become available. Assessment of potential genetic differentiation of Cuvier's beaked whales off the island of Hawai'i from other areas has not been undertaken due to insufficient genetic sample sizes.

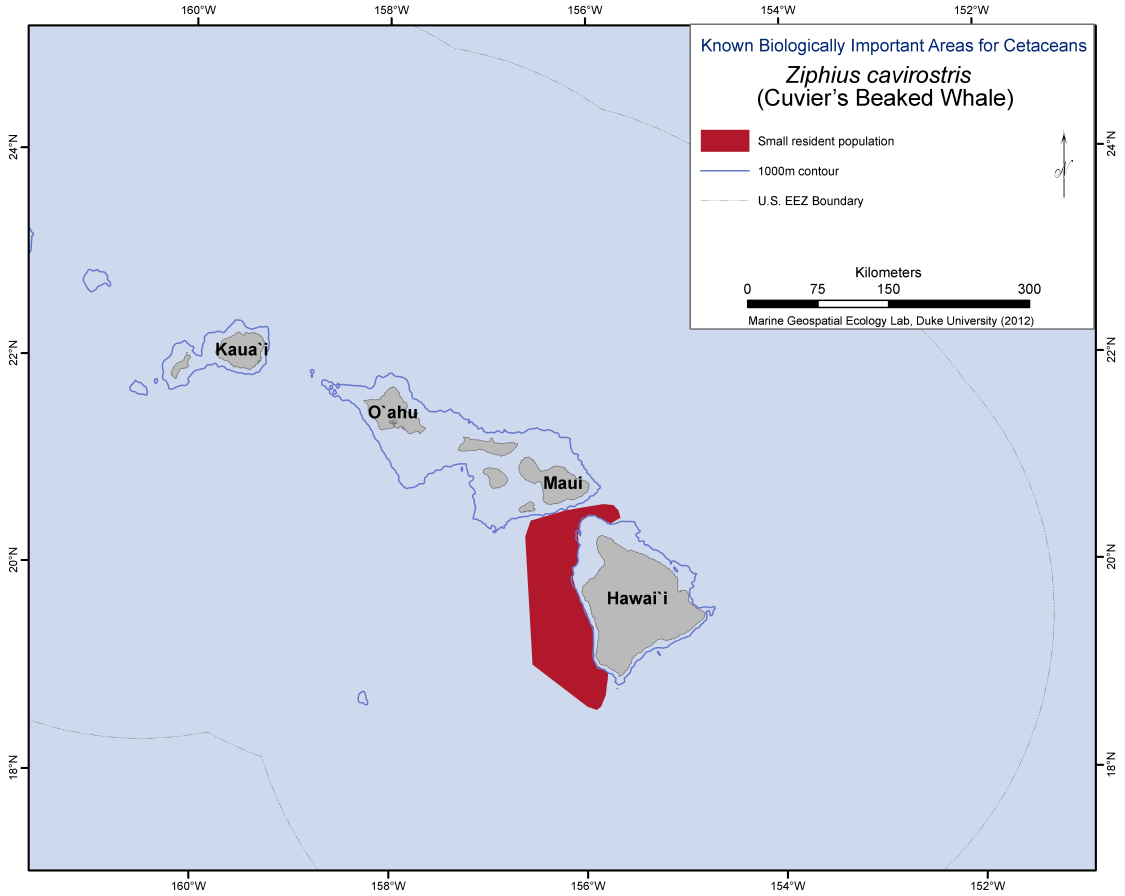

Figure 11: Cuvier's beaked whale small resident population

References

Baird, R.W., G.S. Schorr, D.L. Webster, D.J. McSweeney, M.B. Hanson and R.D. Andrews. 2010. Movements and habitat use of Cuvier's and Blainville's beaked whales in Hawai'i: results from satellite tagging in 2009/2010. Report prepared under Order No. AB133F09SE4843 from the Southwest Fisheries Science Center, La Jolla, CA. Available at www.cascadiaresearch.org/hawaii/CRCHawaiibeakedwhalemovements2010.pdf

Baird, R.W., D.J. McSweeney, G.S. Schorr, S.D. Mahaffy, D.L. Webster, J. Barlow, M.B. Hanson, J.P. Turner and R.D. Andrews. 2009a. Studies of beaked whales in Hawai'i: population size, movements, trophic ecology, social organization and behaviour. ECS Special Publication 51:23-25. Available at www.cascadiaresearch.org/robin/Baird%20et%20al%202009%20ECS%20proceedings.pdf

Baird, R.W., G.S. Schorr, D.L. Webster, S.D. Mahaffy, D.J. McSweeney, M.B. Hanson, and R.D. Andrews. 2009b. Movements of satellite-tagged Cuvier's and Bainville's beaked whales in Hawai'i: evidence for an offshore population of Blainville's beaked whales. Report prepared under Contract No. AB133F-08-SE-4534 from the Southwest Fisheries Science Center, National Marine Fisheries Service, La Jolla, California. Available at www.cascadiaresearch.org/hawaii/Bairdetal2009beakedwhales.pdf

McSweeney, D.J., R.W. Baird and S.D. Mahaffy. 2007. Site fidelity, associations and movements of Cuvier's (*Ziphius cavirostris*) and Blainville's (*Mesoplodon densirostris*) beaked whales off the island of Hawai'i. Marine Mammal Science 23:666-687. Available at http://www.cascadiaresearch.org/robin/McSweeney%20et%20al%202007.pdf

Schorr, G.S., R.W. Baird, M.B. Hanson, D.L. Webster, D.J. McSweeney, and R.D. Andrews. 2008. Movements of the first satellite-tagged Cuvier's and Blainville's beaked whales in Hawai'i. Report prepared under Contract No. AB133F-07-SE-3706 to Cascadia Research Collective, Olympia, WA from the Southwest Fisheries Science Center, National Marine Fisheries Service, La Jolla, California. Available from www.cascadiaresearch.org/robin/Schorr%20et%20al%202008%20beaked%20whale%20satellite%20tagging.pdf

Metadata

Area Name or ID Number		Hawaii Island
Area Type (see choices below)		Small Resident Population
Migration Direction (if applicable)		NA
Months of year designation is applicable		All year
Satellite Tagging data supporting designation (y/n)		Y
	# of tags	45 (9 individuals, 5 years)
	# years in which supporting tagging data collected	5
	Nature of supporting information (see description below)	Movement data was collected for periods of from 2 to 43 days. Data show the population is generally restricted to slope of the island of Hawai'i, with the majority of individuals spending most of their time off the west and southeast side of the island.
Visual Observations/Records supporting designation (y/n)		Y
	# observations/records	
	# years in which supporting visual data collected	
	Nature of supporting information	Analyses of sightings in relation to effort by depth show highest density of groups in water between 1,500 and 3,500 m in depth along the slope of the island, with density decreasing further offshore.
Acoustic Detections/Records supporting designation (y/n)		
	# detections/records	
	# years in which supporting acoustic data collected	
	Nature of supporting information	
Photo-ID evidence supporting designation (y/n)		Y
	# individuals photographed	49 (all photos) or 35 (restricted quality/distinctivness)
	# of years of photo records to compare	10 years between 1990 - 2006
	maximum # years same individual photo'd in area	18
	Nature of supporting information	Long-term photo-identification has indicated high site-fidelity, with individuals using the area over periods of at least 18 years, although there is evidence that adult females may exhibit a greater degree of site fidelity than adult males.
Genetic Analyses conducted supporting designation (y/n)		N
	weak/moderate/strong support for genetic differentiation	

	Nature of supporting information	
What factors justify the boundary selection?		The delineation of the known range of the population is based on a minimum convex polygon (excluding land and locations in shallow water with steep bathymetry, likely due to Argos error) around 581 locations from nine satellite tagged individuals.
Dataset Sources		
Approximate % of population that uses this area for the designated purpose (if known)		~55 individuals
Approximate # of areas known specifically for this behavior (if feeding/cow-calf/mating/migratory) for this population		